ENGINEERS AND ENGINEERING IN OTHER LANDS.

[Specially translated and prepared for the ENGINEERING NEWS.]

The extraordinary growth of the port of Libau, is due to various causes. The Russian Government is averse to having the great wheat trade of Eastern Russia seek Kœnigsberg and Stettin, especially since the protective tariff of Germany went into operation. The town itself has about 16,000 inhabitants, and lies in a neck of land about 1,900 yards in length. The harbor itself extends parallel to the Baltic some ten miles, and is nearly 1½ miles in width. It communicates with the Baltic by

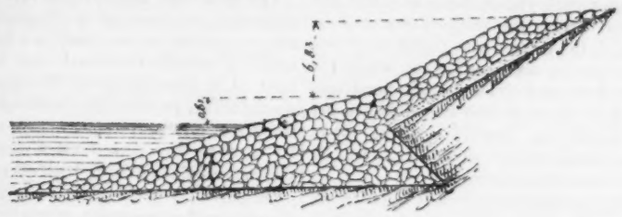


FIG. 1. STRENGTHENING THE SEA BANKS TOWARDS THE WEST.

means of a channel. The pool of Libau is also in connection with the pool of Tosman, which is parallel to the sea bank. The river is very insignificant, and does not bring any detritus down to the channel. The harbor works have been going on for years, but new plans are now to be executed. The width of the port is some 120 feet, and the depth at average water some 16 feet. The channel was formed by pile planks. Two rows of piles were first driven down and then sawed across at low water level; caissons filled with gravel and clay were then placed on top. The entire wall thus made was protected by a number of posts joined together by longitudinal sleepers. This work, strengthened by wooden braces, was not water-tight, and it broke down in several places. The jetties which are in the open sea are laid on caissons filled with stone or on enrockments.

The Russian government has resolved to have several improvements made: the deepening of the roadstead to 7.32 met., at entry; to have new quay walls; new basins; prolongation of the south jetty, and to have two breakwaters with two passages of 15.24 m. each. The object of these breakwaters is to create a maritime current that will be sufficiently powerful to prevent the formation of a bar, and to protect the entrance of the port so as to dredge.

Fig. 1 shows an enrockment which is to be made so as to strengthen the western bank. Fig. 2 and 3 are cross sections of the proposed breakwater. Curiously enough, however, the good citizens of Libau have so energetically protested against building these breakwaters that the government hesitates. The objection is that, by weakening the movements of the tides in the port, these breakwaters will facilitate the formation of ice in the basins in the winter, and freeze up Libau.

Despite the prohibition issued, the works on the great tunnel between England and France are still progressing. If this work be carried out, it will certainly rank as the greatest engineering undertaking that the world has ever seen; for, accustomed as we are to wonders in these days, few will believe in the practicability of such a road. Some 3,000 specimens of the bottom and lower strata have been examined. Chalk is, as might be expected, the principal substance. Between the upper chalk and the gault is a thick bank of gray chalk, which is impermeable. Here and there, however, there are springs of fresh water. Two wells have been sunk, and a gallery at a slight incline, and almost in the vertical plane of the proposed tunnel, has been made. The geological formation is rather simple, alternate marls and chalk, composed of fossils of various kinds.

The following data are common to the two wells:

	Metres.
Altitude of the orifice with relation to the hydrographic zero	30.80
Static level of running waters at 23.83 m. depth, or	6.97
Average static level is at 24.50 m. depth, or	6.30
The Bourdaloue level is at 27.633 m. depth, or	3.17

Greenish chalk was met with to the depth of 21.-78, met. with very hard nodules; at this latter depth the chalk termed "Rouen" was come across, and its base was at 90.20 m. The shafts

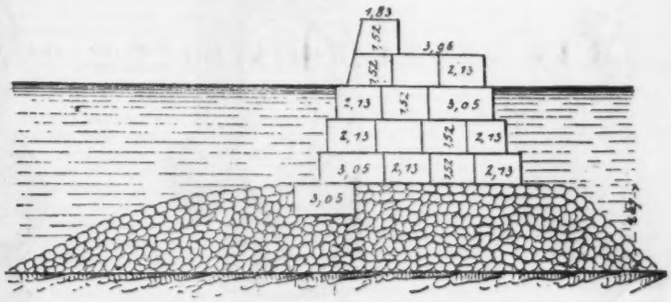


FIG. 2. SECTION OF BREAKWATER.

are timbered, so that the thickness increases with the depth.

Quite a large amount of machinery is established on the French side, and everything completed for the boring machines, which are now being put up; the Beaumont machine being now employed on

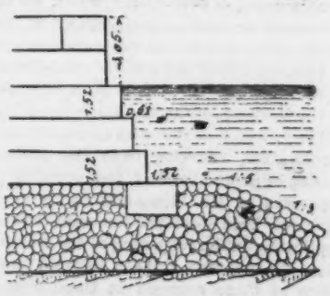


FIG. 3. SECTION OF BREAKWATER.

gallery No. 1, working on a diameter of 2.13 m., and at 55.20 m. below low water. The Brunton machine will begin at 73 m. in the well. These machines will work without the use of explosives, and the rocky part will be taken out in small pieces. The Beaumont machine that has been built for the French company is to work at double speed.

An Austrian patent for an explosive, which is said to offer less danger than others in use has just expired. It was taken out only a year ago by Koeppel. The inventor claimed for it that it is cheaper than any other, gives no injurious smoke or gases, and does not explode from concussion or friction. It is manufactured in two kinds, of which the following is the composition. No. 1 is specially adapted for hard rocks, basalt, etc.; and No. 2 for sandstone, lime, etc.

	No. 1. Parts.	No. 2. Parts.
Saltpeter	35	42
Soda	19	22
Refined sulphur	11	12.50
Sawdust	9.50	19.00
Chlorate of potash	9.50	.....
Charcoal	6	7
Sulphate of soda	4.25	5
Prussiate of potash	2.25	.....
Refined sugar	2.25	.....
Picrin acid	1.25	1.50
	100	100

Each ingredient is finely pulverized and passed through a sieve, then mixed in a mixing cylinder of copper or wood, until the sawdust is hardly noticeable. From 10 to 15 per cent of water is then added, and the whole stirred until large pieces are formed.

RECENT INVENTIONS PATENTED DURING THE PRESENT WEEK.

EXCAVATING MACHINE.

This improvement consists of a wheeled frame carrying a lower skeleton drum, and which is provided by cutting and shaping arms connected to the axles and the rims, and on each end of the axle with small bent knives. The knives are fastened to the buckets at the outer central point. A horizontal cylindrical receptacle having a rotary bottom and revolving S-shaped arms receives the earth from the buckets, which is then thrown out of the opening in the sides of the receptacles by centrifugal force. The machine is driven by steam power located on the frame.

VARIABLE SELF-ADJUSTING ENGINE.

This novel engine is of the double cylinder type, with the cylinders arranged at an angle of 45° from each other. In combination with each cylinder is an unattached auxiliary piston-head or follower, having valves with projecting stems, whereby the pressure on opposite sides of the auxiliary head is equalized, and the length of the piston stroke automatically changed or adjusted to the throw of a variable crank; that is, a portion of the imprisoned steam is permitted to escape when it comes in contact with the cylinder-head, and increased length of piston stroke obtained.

NEW FIRE ESCAPE.

In this improvement one end of such of a series of vertical ladders is fastened to a folding frame, and the other end to a small platform over the opening in the main platform. A pawl secured to a knee lever engages with a ratchet wheel on the roll, on which the ropes for folding and unfolding the frame are wound. Pulling on side ropes which are attached to the knee-lever, releases the pawl from the ratchet and allows the frame to be folded and unfolded. When folded the frame is flat against the building.

RAILWAY-RAIL GUARD.

A recent invention provides a metallic guard consisting of an upright shield having a flanging base, the ends being bent inward and adapted to fit between the upper edge of the rails and its projecting base, and is held in place by engaging the flange under the spikes.

GAS ENGINE.

A late English invention has been constructed, having a power or explosion cylinder and a cylinder for preparing and compressing the charge for the explosion cylinder. It is also provided with an exhaust valve. The cranks of the two pistons, and the valve which regulates the transfer of the charge from the compression cylinder direct to the power cylinder are arranged relatively to each other and to the exhaust valve, so that the latter remains open during about the first nine-tenths of the return stroke of the power piston, and then closes. The charging of the power cylinder with the compressed gaseous mixture is then effected during about the last one-tenth part of the said return stroke of the power piston and about the one-tenth first part of the outward stroke of this piston, at which point of stroke the explosion takes place.

RAILWAY CROSSING ALARM AND SIGNAL.

In this invention the end of a tread lever works in a notch in the track rails, its outer end supporting a rod which operates a bell crank, to which is secured the signal connection. The treadle is carried into or out of operative position through a

sliding wedge piece actuated by the passing wheels through rock shafts connected thereto.

WASHINGTON, D. C. F. B. BROCK.

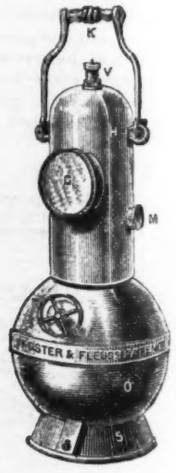
THE FLEUSS PATENT BREATHER FOR WATER, NOXIOUS GASES, OR SMOKE.

The record of the earlier attempts to provide some artificial supply of air to divers under water is very unsatisfactory. The invention of the diving bell is generally assigned to the sixteenth century, but not till the year 1779 was it practically employed in civil engineering operations. In that year Smeaton used it in repairing a bridge at Hexham, Northumberland, England.

In 1828 Mr. Siebe, of the now well-known firm of Siebe, Gorman & Co., invented what was called the Open Diving dress, in which the air escaped into the water from underneath the outer canvass jacket and the water reached within a few inches of the diver's mouth, so that he had to work in a vertical position, the air being supplied from air pumps with three cylinders 3 in. diameter and 9 in. stroke.

About 1839 Mr Siebe, observing the danger attending the use of the open dress, introduced his invention of the close dress and helmet, which is the present form of diving dress used.

In 1880 Mr. Fleuss conceived the idea of dispensing with the Air pump and Air-conducting pipe, and invented an apparatus worn in the form of a knapsack which contains a filter for purifying the breath;



that is, absorbing all the carbonic acid which is given off at each expiration, and mixing the nitrogen, which is retained and used over again with the necessary amount of oxygen, the oxygen being carried in a cylinder at the bottom of the knapsack, in a valve attached, so as to be used easily by the diver, who administers the oxygen as he requires it. In this dress the diver has his life entirely in his own hands, everything being at his command, and he is in no fear of those pumping air to him (as in the ordinary dress used) going to sleep or stopping to fight—cases that have actually occurred, resulting in the diver losing his life, and it will be readily understood that under many circumstances the power of dispensing with the air tubing is of exceptional value in diving operations. To mention one instance where the value of this apparatus is shown: in the Severn Tunnel Works being constructed for a railway between Bristol and South Wales, a heading had been driven under the bed of the river from the shaft on shore. At about a quarter of a mile from the shaft in this heading was an iron door which, after the works had been accidentally flooded, it was essential to shut before pumping out the water could be accomplished. Many fruitless attempts to do this were made with the ordinary diving gear, failure being due to the impossibility of the diver dragging along with him so great a length of air pipe. In a letter dated Nov. 19, 1880, Mr. T. A. Walker, the contractor for the tunnel, wrote to the editor of the London *Times*: "Alexander Lambert, a thoroughly experienced diver, who has been employed by me here for some months, offered with a Fleuss' dress to do what was wanted. On the 10th inst. Lambert walked 1,020 ft. up the headings, pulled up two rails, shut two sluices and closed an iron door, having been away for an hour and a half wholly cut off from signals." Lambert himself wrote: "This work was accomplished after many unsuccessful attempts with the ordinary gear, for I found it quite impossible to get up the heading in consequence of the great length of air pipe."

In the case of the last blow-out at the Hudson River Tunnel, where the dress was used for a week by the men employed on the works, and not by professional divers, the Shallow water dress doing away with the helmet was found to be of especial service, as the diver could hear where the air was rushing out, and could get his head into places where it would have been impossible to get it with the helmet on, thereby stopping many leaks that the ordinary diver would have had to leave. (See testimonial appended.)

The Noxious gas apparatus is also worn in the form of a knapsack, with a face mask which is made air-tight by means of an air-cushion and broad straps at the back of the head; and much valuable work has been done and many lives saved with this apparatus, notably, at the Seaham Colliery.

The following is an extract from the Preliminary Report of Her Majesty's Commissioners, appointed to inquire into accidents in mines, and the possible means of preventing their occurrence, or limiting their disastrous consequences: "On one important subject, namely, the possibility of enabling men to enter and to carry lights into deadly gases, or even under water, we have lately examined the various contrivances of Mr. Fleuss, for enabling men instructed in their use effectually to prosecute their work under a considerable depth of water or amidst the most deleterious vapors. In the workings of the Maudlin Seam of the Seaham Colliery, which contains an accumulation of dangerous gases, resulting from the calamitous explosion of September last, the portable breathing apparatus of Mr. Fleuss and his protected lamp have now been employed for some weeks. Their application in the reopening of the works has been of great advantage, and has inspired much confidence in those engaged in these critical operations."

At Killingworth Colliery, where, by the falling in of a shaft, nine men and a boy were entombed, on trying to enter the mine by a disused shaft, the air was so bad, through the ventilation being stopped, that the ordinary safety lamps would not burn. The Fleuss breathers and lamps were sent for from Seaham Colliery, which was nearer than London, and the men were rescued, having been 18 hours entombed; and to show how narrow an escape they had, and how necessary it is that such apparatuses should be kept handy, one of the men died after coming to the surface from the foul gas he had inhaled.

The same apparatus is invaluable for entering Smoke, Sewers, Beer vats, etc. We leave our readers to judge of the numbers of fires that might be prevented if such an apparatus were at hand in our manufactories, stores, warehouses, theatres and hotels. At the alarm of fire, smoke is generally the first thing perceived; should a person be able to penetrate that smoke a bucket of water would do in most cases what the fire brigade very often cannot do when it arrives, as the fire has completely got the mastery and the result may be total ruin.

The combined apparatus is especially useful on shipboard, as access can be obtained to a damaged screw propeller, or to a leak in a flooded compartment, or outside the vessel; and for a fire in the hold of a vessel it would be invaluable, as the smoke which precedes the bursting out of flame in these cases is proverbial. These apparatuses can be used by any person after slight instruction, their manipulation being both easy and effectual.

On Thursday evening we witnessed a test of the Fleuss breather in smoke, given by Mr. Brown at the Repair shop of the New York Fire Department, 130 W. 3d street, in presence of Chief Shay, several other officials of the department, a city alderman and some newspaper reporters. In a narrow brick cell dense smoke from burning rags and cotton waste saturated with oil, was produced and confined. Mr. Brown, wearing a breather, remained in this dense atmosphere of smoke and heat without a chance for communication with the outside air for over thirty minutes, which was considered a test fully as good as a more lengthy one would be. No person unprovided with artificial aid to breathing could have endured such an atmosphere for three minutes. The firemen, rather apathetic at first, were well pleased at the test, and became quite interested after seeing it carried out. The Fleuss lamp was taken into the cell by Mr. Brown, and elicited the warm commendations of the firemen.

They are manufactured by Messrs. Fleuss, Duff & Co., of London, Eng., whose agent, Mr. J. B. Brown, is now in this country, and can be addressed at 81 East Tenth street, New York.

THE ENGLISH CHANNEL TUNNEL AND CARBONIC ACID GAS.

(London *Times*, May 6, 1882.)

To the Editor of the Times:

SIR: With reference to the proposal which my excellent friend Dr. Siemens is reported to have laid before our military authorities, would you permit me to describe a small experiment? Coming down here from London to-day, on a part of the line where our speed was about 30 miles an hour, I took out my watch and determined how long I could hold my breath without inhalation. By emptying my lungs very thoroughly, and then charging them very fully, I brought the time up to nearly a minute and a half. In this interval I might have been urged through more than a half mile of carbonic acid gas with no injury and with little inconvenience to myself. Indeed, supposing the tunnel to be entirely filled with carbonic acid gas, I have sufficient confidence in my

friend's ability to wager that in six hours he would be able to devise a means of sending troops safely through it. *The problem of supplying fresh air to persons surrounded by an irrespirable atmosphere has been already solved by Mr. Fleuss and others.*

Your obedient servant,
Haslemere, May 2. JOHN TYNDALL.

NEW YORK, Sept. 9th, 1882.

J. B. Brown, Esq.:

MY DEAR SIR: In our recent *blow out* at the heading of our works on this side of the river, and the usual inflow of water, we found your Fleuss diving apparatus of very great service in regaining control of the heading. Our workmen, although not accustomed to its use, worked it very efficiently and successfully. I shall try to secure an outfit and keep on hand ready for such emergencies in the future. It speaks loudly for itself when the occasion arises for its use. Trusting we shall not have occasion to use one for some time to come, I remain, Yours respectfully,

D. C. HASKIN, Manager.

THE HYDROGRAPHIC OFFICE.

WASHINGTON, Sept. 11.—The Hydrographic Office of the Navy is a department of our naval service which deserves to be better known than it is, since its usefulness is by no means limited to the navy proper. By some persons it is sometimes confounded with the coast survey, but the two branches of the service are widely different. Not only does the Hydrographic Office accomplish most valuable results in increasing the general stock of knowledge concerning the navigable waters of the world, but it affords a valuable training to a large number of naval officers, and increases their fitness for the command of our vessels. The last official register shows that there were in January 22 officers thus employed. The office is in charge of a commodore, who has as his assistants, one commander, five lieutenant commanders, four lieutenants and 11 masters. The present chief is Commodore De Krafft, an able and experienced officer, through whose courtesy the following interesting information has been obtained :—

HOW THE OFFICE WAS ESTABLISHED.

The Hydrographic Office, as it now exists, was established by act of Congress, approved June 21, 1866, which provided that "there shall be a Hydrographic Office attached to the Bureau of Navigation, in the Navy Department, for the improvement of the means for navigating safely the vessels of the navy and of the mercantile marine, by providing, under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instruction, for the use of all vessels of the United States, and for the benefit and use of navigators generally," etc., etc. It is the aim of the Hydrographic Office to make this country independent of foreign sources of supply in providing charts and other hydrographic information to our navy and mercantile marine, and to co-operate in the circulation of all knowledge that may be useful to navigators. This information, in the main, takes the form of charts, books and notices. Each of the great maritime powers has its hydrographic depot, and between these there is constantly going on a free exchange of all new data deemed of sufficient importance for publication. Let each strive to be independent of the others in respect of what is already known; hence, when a chart is published from an original survey made by one depot, it is the object of other depots to publish this chart in its own way for the benefit of its own country. It is thus seen that the work of our Hydrographic Office is not confined simply to the publication of its own hydrographic surveys, and it is a fact that the greater number of our charts are derived from foreign sources. The vast amount of labor and detail involved in this scheme is at once apparent to those who have had experience in surveying and "bringing up the work;" but it is probable that only a vague idea rests in the minds of the people at large in reference to the matter. There is no time when the Hydrographic Office could not usefully employ as many officers as the navy can spare from other duties, and the cry is constantly going up for more officers. Since the information to be published is for sailors, they are the best judges of what should be given, and as the analysis, or translation or origination of the work often calls for the exercise of a considerable scientific knowledge, naval officers are especially well fitted for the task.

WORK FOR NAVAL GRADUATES.

The hydrographic office fulfills another purpose of great value to a country like ours. From the nature of its work, it is one of those naval institutions which provide a post-graduate course of practice in the scientific, mathematical and professional principles taught officers at the Naval Academy, without which an officer's knowledge in time of peace would either be forgotten or reduced to mere abstract ideas which could not be immediately applied in emergencies. Incidentally, it may be said that the same useful practice is given to those officers who serve as instructors at the Naval Academy, and to those who are at the Naval Observatory, Nautical Almanac Office, in the Coast Survey and in the several bureaus at the Navy Department, etc. It has been said that the worst use to which a man can be put is to hang him. Certainly no educated officer can be put to a worse use than on "waiting orders," when he is of no use whatever. To put any line officer on "waiting orders" should be a last resort, the necessity for which should be plain. Take a lieutenant for example, who gets $1,600 on "waiting orders" when he is absolutely dead to the service for the time being, and $2,000 on shore duty, when the education which the country has generously given can be utilized to the utmost. Here is $1,600 for doing nothing, and $2,000 for doing something, and if that something cannot be made worth more to the country than the $400 per annum difference ($1 10 per diem), there must indeed be something "rotten in Denmark." Our navy should be small, but no smaller than will provide an expansive nucleus for a war footing, and it becomes necessary, therfore, to prove some warrant for its existence on such a basis, and this is found in the fact that the officers can be made as useful in peace as in war. This is a growing country, and naval officers should be encouraged to help the growth rather than to be drones sapping the public purse. The country will discover after a while that such places as the Hydrographic Office can provide useful work for the talented graduates of the Naval Academy, and will then insist on a stoppage of this bad practice of "waiting orders"—in pay and out of practice. A few years ago it was difficult to find naval officers experienced in surveying, but so far is this from being the case now that any man-of-war afloat can be ordered to proceed immediately to surveying duty, with the surety that there are experienced surveyors on board who have done field work in the navy or coast survey, or both. And to this duty vessels are constantly being put.

WHAT THE OFFICE ACCOMPLISHES.

The Hydrographic Office, in concert with the Bureau of Navigation, of which it is a branch, draws up schemes of surveys and directs their execution, prepares projections, sifts plots and arranges the field work, prepares the drawings for the engraver or lithographer, and finally publishes the chart in the best shape for the navigator. The Division of Drawing and Engraving is intimately connected with this branch of the work. The duties of the other divisions may be stated as follows : Up to the present time 912 different charts have been published by the Hydrographic Office, which, with but few exceptions, are of ports outside of the United States, charts of the same ports being made by the Coast Survey. These charts are constantly being corrected, as the data for correction, contained in "Hydrographic Notices" and "Notices to Mariners," comes into the office. All bars to the safe navigation of the waters and harbors of the globe, all changes in the outlines of the various coasts, all discoveries of dangers and doubtful dangers in the oceans, streams and harbors of all countries, and all changes in lights and lighthouses, fog signals and buoys are noticed on all charts affected by them, and these constant corrections on numerous charts keep a force of three naval officers and one civilian draughtsman in the Chart Division constantly employed. This work is sufficient to keep at least double this force employed all the time. All United States vessels of war are supplied with their charts directly from the Hydrographic Office. Merchant vessels get their charts from agents in the several seaports on our Atlantic and Pacific coasts for simply the cost of the paper and printing.

PRINTED AND PHOTOGRAPHED CHARTS.

All American charts are printed in the Printing-Room of the Hydrographic Office, from plate engraved from the original surveys by our own naval officers. The demand for these charts is so great that a force of four printers is kept constantly employed. Most charts from British or other foreign surveys are photo-lithographed by contract; but on account of the many difficulties experienced with these charts heretofore it is now proposed to transfer them to plates. Copies of all charts published by the British Admiralty and not yet reproduced by our own office (about 3,000 in number) are kept in the British Admiralty Chart Room, and are issued to vessels of the United States navy only. These charts, likewise, are kept corrected from charts of later date, from information received from United States vessels and other reliable authority. All of this work is done with care by skilled naval officers and draughtsmen, as upon the accuracy of the charts depends the safety of vessels and the lives of the crews.

DUTIES OF THE OFFICERS.

For the proper performance of the work in this division five officers are necessary, and about this number have been employed during the past year. Their duties are divided as follows:—One chief of division, who has charge under the Hydrographer, and exercises a general supervision; one lieutenant master, or ensign, in charge of lights, lists, and sailing directions, and acting as translator; one lieutenant master, or ensign, in charge of the catalogue of archives, and of the standard charts, and acting as translator; two lieutenant masters, or ensigns, engaged in the preparation of notices. In the preparation of these latter the information is grouped, as far as possible, so that all relating to one squadron may occupy a separate notice. After being arranged by the chief of division, it is turned over to one of the officers whose duty it is to prepare the notice for the printer, and the latter, by reference to an index chart and the various sailing directions and light lists, ascertains which of these is affected, and attaches this to the notice. The latter is then sent to the Assistant Hydrographer, who scrutinizes it, and afterward sends it to the Hydrographic and British Admiralty chart rooms, and any errors or omissions in the chart references are corrected. Finally, on a requisition signed by the Hydrographic and the Chief Clerk of the Navy Department, the matter is sent to the Public Printer, and, after two proofs are read at the Hydrographic Office, it is issued to the various squadrons, navy yards, agents, and to any shipmaster who may write for a copy.

AN ENORMOUS AMOUNT OF WORK.

While the notices are in preparation, the various charts and light lists which may be affected are corrected to correspond, and after publication the notices are cut into slips and the latter pasted in the books of sailing directions opposite the pages to which they relate. Twice each year, on the 1st of January and the 1st of July, a supplement to each light list is published, containing all changes for the previous six months. These changes are so numerous that every two or three years a new edition of each of the six numbers of the light list is prepared, affording navigators a complete and accurate description of all the lights in the world. The Danish, Swedish, Norwegian, German, Dutch French, Spanish, Austrian, Portuguese and Italian notices require to be translated; the Russian are published in French, and the more important Chinese and Japanese notices are received already translated into English, and all the others are published in that language with the exception of the Turkish, which are also in French. During the fiscal year ending June 30, 1882, this division prepared 116 notices to mariners and 85 hydrographic notices, containing from one to fifty pages and from one to 150 numbered paragraphs each.

OCEAN METEOROLOGY.

The Meteorological Division of the Hydrographic Office has charge of the collection of data of all kinds pertaining to ocean meteorology and of reducing this data into such shape that it will be of the greatest use to the mariner. All national ships are obliged to keep a daily record of weather phenomena. Beside which the office has a large corps of volunteer observers aboard merchant ships of almost every nationality. As the logs are received they are inspected to see that they have been kept according to the required standard. If they are found to be correct all data is compiled and condensed and laid aside for future use. Charts of the seven oceans of the world are divided into five degree squares, and for convenience of reference each square is numbered. After all the data has been grouped into five dozen squares it is again reduced, and a monthly mean for each month of the year is obtained. This monthly means at times represents the observations of hundreds of ships that have passed through the square, some only taking a few hours and others days. Four years ago this office published a Meteorological Chart of the North Pacific Ocean. To-day it has in the hands of the engravers a chart of the North Atlantic Ocean, which will be published very shortly. Data for a South Atlantic chart is almost ready. As the work of reducing and grouping the observations requires a certain amount of technical education, it is done by our naval officers. At the present moment there are hundreds of log books in the Navy Department that have never been examined, and a force of twenty officers could be most advantageously employed for the next five years in extracting and preparing the data for publication. It is the design of the office to publish meteorological charts of all the oceans, and it has been only on account of the lack of adequate force to compile and reduce the data that it has not been more rapidly executed. With these charts at hand the mariner will be enabled to see at a glance the past experience of hundreds of navigators in respect of weather at sea, and will thus be enabled to form a good judgment of the best route from port to port in any sea and in any season.

LIBRARY AND BOOKS.

The Division of Library and Books has charge of the issue of hydrographic book publications of all kinds. It also has charge of the Hydrographic Office Library of reference, in which hydrographic information in all languages may be found. During the year ending July 30, 1882, 1,033 volumes of sailing directions and 3,342 other publications were issued through this division to authorized agents and to our vessels of war. Three officers find employment here in keeping the expenditure and receipt books of the office and in correcting sailing directions, etc.—*N. Y. Telegram.*

ENGINEERING NEWS
AND
AMERICAN CONTRACT JOURNAL.

Tribune Building, New York City.

GEO. H. FROST.....EDITOR AND PROPRIETOR.
S. D. V. BURR.....ASSOCIATE EDITOR.

SATURDAY, SEPTEMBER 16, 1882.

EDITORIAL ANNOUNCEMENTS.

Terms of Subscription.—To the United States and Canada, $4 per annum, including postage; all parts of Europe, $5, payable in advance. Remittances at the risk of the subscriber, unless made by registered letter or by draft, check or P. O. order, payable to GEO. H. FROST.

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Articles for Publication in the current number should be received at the office of publication not later than Thursday morning, and advertisements not later than Friday noon.

Correspondence upon subjects which naturally belongs to the province of this journal is solicited.

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PHILADELPHIA SCHOOL OF SEWERAGE.—At the meeting of the Homœopathic Medical Society in Hahnemann Medical College, the secretary, Dr. Mohr, reported that the recommendations of the city in favor of egg-shaped sewers had been complied with by Councils, and hereafter all the small sewers built would be on that plan. It was also reported that arrangements were in progress looking to the delivery of a lecture by Colonel Waring on the sewerage system of Philadelphia, but had not yet been completed.—*Philadelphia Times*, Sept 15.

THE EDISON SYSTEM OF ELECTRIC LIGHTING.

A certain quantity of electricity passing through a good conductor produces no physical effect on the conductor: but a constriction in the conductor or an interposition of a material that is not so good a conductor causes an effect analagous to that of a large quantity of water violently forced through a small pipe—a crowding of the particles ensues, creating friction and consequent heat. Upon this simple principle all electric lights operate. In both the arc and incandescent lamps there is a resistance present at the point of illumination, and heating occurs.

It is our purpose in what follows to briefly describe the recently inaugurated Edison system of electric lighting as now in operation in this city.

The Edison Electric Light Company was organized in October, 1878, with a capital of $300,000; this has been increased on two occasions until it is now $720,000. The company owns the patents of Thomas A. Edison, and under them its operations are carried on. Although the lamps and dynamos of Mr. Edison have been extensively used both in this and foreign countries, nothing was tried in the way of general illumination from a central station until the dynamos were started in this city on the 4th inst. This district embraces the area bounded by Wall, Nassau and Spruce streets and the East River; the dynamos are located at Nos. 255 and 257 Pearl street. During the early part of the present week we visited the general offices of the company at 67 Fifth avenue, the central station, and also many of the users of the new light.

THE STATION.

The boiler room is located in the basement of the building. There are now in place four Babcock & Wilcox boilers and four others are being prepared, which will give an agregate horse-power of 2,000, working under a pressure of 120 pounds. The four boilers are arranged in pairs facing each other and at a sufficient distance apart to permit the fireman to attend the furnaces. The coal is received in bins placed under the sidewalk, and is then shoveled into a trough in which works a screw, and which leads over the first set to the space between the boilers. The ashes are thrown into a receptacle under the flooring and conveyed out by the same plan. A Sturtevant blower furnishes the blast needed by the boilers, fresh air for ventilation and for the dynamos, as will be mentioned later. Two smoke stacks, one for each set of boilers, extend up through the centre of the building to the roof.

The first and second floors of the building were removed and an iron superstructure erected entirely independent of the walls of the building, and resting on separate foundations. On this the dynamos are placed. We could not obtain a satisfactory explanation to our query as to why the heavy machinery in rapid motion was elevated and the dead load placed on a solid foundation in the basement.

THE DYNAMOS.

There are six dynamos now in position (this number will be doubled as soon as the equipment is completed), the armature of each being driven by a Porter-Allen engine having a cylinder diameter of 11 ⅜ in. and a stroke of 16 in. These are directly connected and are expected to make 350 revolutions per minute.

The armature is of the Siemens pattern; its foundation, or core, which is built upon the shaft, consists of a series of sheet iron discs, separated from each other by layers of thin paper and bolted firmly together. This method of constructing the armature, while it has all the advantages of solid iron, prevents the great loss of power due to induced or local currents, which would be present if it was one piece. The face of the armature is made up of heavy copper bars, having a trapezoidal cross-section, their dimensions being ¾ by $\frac{85}{100}$ of an inch. To insure a perfect insulation, each bar is wrapped in Japanned paper and separated from the iron core beneath it and from its neighbors, by an air space.

There are the same number of copper discs as there are bars, one half being at each end of the core. Each disc has two projecting lugs, one on each side, these lugs being placed nearly but not quite diametrically opposite to each other. The e are bolted together so as to form, with the iron discs constituting the core, one solid mass. Each end of every bar is connected to one of the lugs.

Air from the blast enters horizontally opposite the center of the armature, and, as the spaces above mentioned permit of a free circulation through the parts, all liability of the accumulation of heat is prevented and the capacity of the machine greatly increased. In order to resist the centrifugal force developed by the high rate of speed, the bars on the armature are wound with piano wire at certain places.

The commutator in these dynamos consists of 49 bars of copper placed longitudinally on the shaft and separated from each other by an insulating material and connected with the armature bars. So, each bar on the commutator forms the terminus of a continuous loop or convolution through the copper rods and discs on the armature.

The brushes are composed of alternate layers of fine copper wire and plates soldered together.

The armature is 27.8 inches in diameter and 61 inches in length; the armature shaft is of steel, 7¾ inches in diameter and 10 feet 3 inches long; the commutator is 12¾ inches in diameter and 18 inches long; the journals are 6½ inches in diameter, 15 inches long, and have Babbitt metal bearings in pillow blocks of the box pattern. In order to prevent undue heating by friction, constant lubrication is provided for and there is a continuous current of water flowing beneath the boxes.

The magnet is composed of two large pole pieces of cast iron, having semi-cylindrical faces, between which the armature revolves. These poles are 49 inches wide and 61½ inches high. To these poles are attached twelve cylindrical cores of soft iron, wound with coarse copper insulated wire, through which the electric current passes. Four of these cores are attached to the lower pole piece and eight to the upper. The twelve cores are 57 inches long, the eight upper ones having a diameter of 8 inches and the four lower ones 9 inches. There are four soft iron keepers, 11 by 9 inches securely bolted together and attached to the cores.

The current from one of the mains of the commutator passes through the wire wound upon the nearest middle core, thence to the one directly above; then to the one beneath; from here it takes the same course through the other three vertical sets in succession. Before entering the other main the current circulates through a resistance which increases or diminishes the magnetic strains as may be needed by the demands.

A safety catch is placed on each dynamo. This consists of a break in the conducting wire which is filled with a piece of metal having a low fusion point. Should any undue heating occur, this metal is fused, and a break thereby caused in the circuit, and the main and lamps saved from any possible injury.

Each of the six dynamos weighs as follows:

	Lbs.
Armature and shaft	9,800
Two pillow blocks	1,40
Magnet, complete	33,000
Zinc cases	680
Total	44,820

The copper used in construction is distributed as follows:

	Lbs.
Armature bars	590
Armature discs	1,350
Magnet wire	1,500
Total	3,440

The magnet rests upon insulating bases of cast zinc 3 in. thick. The dynamo and engine are mounted on a base plate of cast iron, made in two parts for convenience, and bolted together.

This bed plate is 14 ft. long, 8 ft. and 9 in. wide, and weighs 10,300 pounds. The entire weight of the steam dynamo is as follows:

	Lbs.
Dynamo	44,820
Engine	6,450
Base plate	10,300
Total	61,570

After leaving the dynamo the current passes through a circuit breaker, which consists of two sets of copper plates, the upper set being so arranged that it can be raised free from the lower, or depressed, so that the plates will overlap and insure a perfect contact.

The electric current from all the dynamos is led into a common main, from which branch the various feeders leading into the street and supplying the district.

A test line leads from the dynamos to a room upstairs, upon one wall of which are grouped one thousand lamps, so arranged that any number of them can be placed in the circuit. The current from any one of the dynamos can be sent through the test line to the lamps and its power thereby ascertained, and its real working condition or capacity obtained.

Each of the dynamos has the nominal power of a 1,200-light machine at 16 candle-power incandescence. This can be readily increased to 1,400 lights of the same power without heating the armature or in any way heating or burning the brushes or commutators. This result is accomplished most

economically, and is due to improvements in the lamp itself.

The mains, which may be said to collect the current from the several dynamos, lead along one wall of the room to the front where the connections are made with the feeders. At this point a piece of low fusion metal is inserted in each of the bars of the feeders in the same manner and for the same purpose as already described.

In the room above is an indicator for keeping the electro-motive force within certain defined limits. The current passes through an electro magnet, before the face of which is an arm held back and away by a spring. The power of the magnet depends upon the electro-motive force passing through the coil. A too powerful or too weak current is shown by the lighting of a red or a blue incandescent lamp. Watching these lamps, the attendant, constantly at hand, throws in or removes resistance coils as the case may require.

THE DISTRIBUTING SYSTEM.

The word "distributing" may be aptly applied to the method of placing the electric current at the disposal of the patrons. An iron pipe is laid underground through the streets, and protects two heavy semi-cylindrical bars of copper, which are perfectly insulated both from each other and from contact with any outside object. At the station each of these bars is connected with the mains from the machines as already described. These bars enter an iron box at every place where it is desired to "tap" the current, and wires are attached leading into the house. Low fusion metal is here again inserted. The box is then filled with an insulating compound and the caps securely bolted in place.

METERS.

Each consumer is furnished with a meter consisting of a bottle containing sulphate of zinc, in which is immersed two bars of zinc, kept at a constant distance apart. An infinitesimal portion of the current passes through the meter, causing a decomposition which increases one of the zinc bars and decreases the other. At stated times these bars are taken to the station, and the difference ascertained. As a certain quantity of electricity will produce an invariable effect—in this case decomposition—the quantity which passed through the meter can be readily computed, and as this bears a known ratio to the current entering the premises, that can also be found. One most decided advantage in this arrangement is that the consumer pays only for what he uses. "An inferior 'quality' of the illuminant will never affect the reading of his meter."

THE LAMP.

The lamp consists of an exhausted bulb of glass, pear shaped, and containing a loop of carbon made from bamboo, and of a thickness a little larger than a horse hair. The ends of the loop terminate in two platinum wires passing through the ceiling, and so situated that when the lamp is placed in its socket these wires will form contact with those leading from the street and carrying the current. By turning a key the current can be shunted from the lamp. An accident to one lamp has no effect upon any other in the same circuit. Each lamp is provided with a portion of the low point fusion metal so often noted.

FIRE PRECAUTIONS.

It is one of the laws governing the action of dynamic electricity that an absolutely complete circuit must be established before we can obtain any current and upon the severing of this circuit at any point all effect instantly ceases. As stated in the beginning of this article, heat will be developed where there is the most resistance. Owing to these reasons Mr. Edison has adopted the most effectual means for breaking the circuit and destroying the current before any dangerous amount of heat could be developed. A metal with a low fusion point, or one which will open the circuit at a low temperature, has been placed between the severed points of the conductors at every point where its guardian powers were deemed desirable. In case of the destruction of this metal at any place it can be easily and quickly renewed after the cause has been ascertained. No danger is possible from the lamps themselves, as the fracture of the globe destroys the light instantly.

Interior illumination by incandescent lamps may be considered one of the institutions of this city, and judging from the favor with which it has been received, its growth is only a question of time—a short time at that. The steadiness, color and brilliancy of the light commend it for almost any purpose, and its absolute freedom from noxious vapors will endear it to all lovers of pure air.

PAINTING THE BROOKLYN BRIDGE.

In June last the trustees of the New York and Brooklyn bridge advertised for proposals for furnishing about 10,000 gallons of paint, to be made according to the following formula: 70 pounds first quality white oxide of zinc; 30 pound of best white lead; 6 gallons raw Calcutta linseed oil, with such staining material as may be necessary to give the desired color. The paint to be ground and to weigh not less than 18 pounds per standard gallon. In order to see that these conditions would be complied with, the trustees stipulated that they be allowed to place an inspector in the manufactory of the contractor and to whom should be afforded every facility for examining the material, process, packing, etc. Should any of the paint be found to contain other materials than those specified the trustees had the right to annul the contract and to obtain any balance that might be from such sources as would be for the best interests of the work; but if the cost be more than that of the contract then the contractor will be held for the difference in price.

On July 5 the following bids were opened:

	Per gallon.
Ed. Smith & Co	$1.52
" " second bid	1.26
Seeley Bros	1.30
Chas. E. McBride	90
Harrison Bros. & Co	1.40
N. J. Enamel Paint Co	1.35
C. A. Woolsey	1.16¼
E. Blunt	1.20
F. W. Devoe & Co	1.28
C. T. Raynolds & Co	1.25
John W. Masury & Son	1.15
" " linseed oil	1.05
H. W. Johns Mfg. Co	1.47
W. P. Husband	1.65
Union White Lead Mfg. Co. Paint, 6 3-10c. per lb. Raw Am. linseed oil, 63c. per gal.	

The bid of Chas. E. McBride at 90 cents per gallon was withdrawn and the contract awarded to Messrs. Masury & Son at $1.15.

The position of the bridge subjects its iron and steel work to atmospheric influences which are extremely corroding. Under these circumstances the formula above given for mixing the paint was believed to be the most advantageous that could be obtained. It was also believed that not only would the surfaces be perfectly protected, but that the paint itself would have such durable qualities that its renewal would be unnecessary for some time.

In speaking of the condition that the paint must weigh 18 lbs. to the gallon, one of our esteemed contemporaries states that, "Made up with all honest intention, so as to give as good a paint as the formula is capable of making, the weight will be but 17¼ lbs. per gallon. Sealed up in tin cans this paint will weigh just 18 lbs. per standard gallon." We were informed by Mr. C. C. Martin, First Assistant Engineer of the bridge, that one U. S. sealed gallon, on Fairbanks' standard scales, weighed over 18 lbs.

In order that there may be no deception, small quantities of paint from the same package will be analyzed by the contractors and by the bridge authorities, and the results compared. This will be repeated as often as may be deemed essential to the best interests of the work.

The task of painting the bridge is progressing rapidly. The paint is mixed with oil by the company in such proportion as will render it of the desired consistency. No dryer is used, as, when ten or twelve hours of dry weather seem assured, there is no danger of a subsequent washing. When considered necessary, one will be used. French ochre is used for coloring, and is obtained direct from the importers.

Mr. W. B. Adams is in charge of the small army of painters. This gentleman has had much experience in this class of work, and is now engaged in painting the just-completed Kinzua viaduct.

Some sections present many difficulties, and all require constant care and a perfect absence of any liability to dizziness. The painters straddle the cables working backward. When it is remembered that these cables are about the size of a barrel, and are at a great distance above water level, the operation of reaching under to paint the lower side becomes one of great nicety. The suspender rods are painted by a man swung from the cables. The trusses present no special difficulties. Under the floor beams a stout plank is suspended which is long enough to cover three beams. Six men, one upon each side of each beam, sit upon the plank and work. By this means a man only paints the surfaces which face him. The plank is shifted in a direction parallel to the beams. A close inspection of the work already done failed to reveal a blank spot, clearly proving the thoroughness of the work. In all probability only one coat will be put on this fall.

PERSONAL.

T. E. SICKLES is Chief Engineer of the West Virginia Central & Pittsburgh Railroad.

CHIEF ENGINEER MCWILLIAMS, of the Wheeling & Lake Erie road, has resigned, and it is said will be succeeded by Mr. C. F. WILSON.

W. J. KIRK was elected Chief Engineer and Superintendent of the Atlantic & French Broad Railroad at the annual meeting held at Belton, S. C., on Aug. 17.

MR. FRANK SHANLY, a well-known civil engineer, who, with his brother, constructed the Hoosac Tunnel, died on the cars Wednesday morning, between Mallorytown and Brockville, Ontario.

SIR FREDERICK BRAMWALL, the engineer who is promoting the English Channel Tunnel scheme, arrived in this city by the Parthia on the 13th. He intends to spend a few weeks here in rest and recreation, but will inspect some of our most prominent engineering undertakings.

MR. P. L. INNES, for some time past Principal Assistant to D. C. LINSLEY, Contractor and General Manager of the Canada-Atlantic road, resigned his position, on Aug. 20, to become a partner with Messrs. COOK & JONES, contractors for the Toronto harbor and island improvements for the Dominion government. The firm is now COOK, JONES & INNES.

THE death of EMILE PLANTAMOUR, the Swiss astronomer, at Geneva, on the 14th, is announced by cable. He was born in Geneva, May 24, 1815, and studied at the University of Kœnigsberg, where he was created a doctor of philosophy in 1839. He was subsequently appointed Professor of Astronomy and director of the observatory of Geneva. In 1865 he was elected a correspondent of the French Institute, previous to which he was elected a member of the Society of Physics and Natural History of Geneva and of the Astronomical Society of London. Besides his annual publications on his astronomical observations he wrote a Latin thesis, *Disquisitio de methodis traditis ad cometarum orbitas determinandas*, and several other works on his favorite science.

A NEW driver, fresh from the country lyceum, was initiated into the horse-car business on one of the Norwich routes the other day. The peculiarities of his style in collecting fares excited the mirth of his first car-full of passengers. After he had finally collected all the money that he reckoned was due him and escaped to the platform, a couple of girls tittered. He wheeled round solemnly and remarked in the parliamentary language of "Cushing's Manual:" "If any of you people hain't paid their fares they will please manifest it by rising."—*New London Day.*

NEW YORK, WEST SHORE AND BUFFALO RAILWAY.

This company is now vigorously pushing its track-laying in Rockland, Orange, Ulster, Albany, Schenectady, Oneida, Madison and Onondaga Counties. Up to the 9th inst., 37 miles were laid. Track material for about 125 miles of double track is distributed along the line ready for use. Iron bridge superstructure was also erected at that date to the amount of 980 tons, with a further amount of 6,400 tons manufactured and in process of erection.

The construction of passenger and freight stations, engine houses, turn-tables, tank houses, wells and pump houses, is also in progress at Newburgh, Kingston, Milton, Catskill, New Scotland, South Schenectady and Canastota. Contracts have also been awarded and construction will be immediately begun on the passenger and freight stations at Marlboro, Highland, Esopus, Glasco, Coxsackie, Saugerties, Coeymans, West Athens and other points.

The great tunnel at Weehawken is rapidly approaching completion; on the 1st inst. only about 740 ft. (or 19 per cent. of the whole length), remained unfinished. It will probably be through on or before the 1st of December next.

The Haverstraw Tunnel, of 1,600 ft. in length, is completed, and the West Point Tunnel, of 2,660 ft. in length, is now within 130 ft. of completion. It will, in all probability, be finished by Nov. 15.

The force working on the line between Weehawken and Middletown, and Cornwall Junction and Syracuse, on the 1st inst., was: 19,000 men, 120 steam and compressed air drills, 17 steam excavators, 3 dredging machines; total equivalent in "men," 23,400. And in addition thereto, 3,731 horses, 37 locomotive engines, 1,242 cars, 16 pile-drivers, 65 steam derricks, 8 steam pumps, 28 tug-boats, scows and barges.

WALTER KATTÉ, Chief Engineer.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 317.)

CCCLXXIX.—AGAWAM.

Agawam, Massachusetts, in lat. 42° 5′ N., long. 72° 40′ W., is in a rolling country, on the west bank of the Connecticut River. Settled in 1660, it was incorporated as a town in 1857.

Water-works were built as a private enterprise in 1877 by C. L. Goodhue, taking the supply from springs flowing from the base of a bluff, back of which extend sandy plains.

The water is conveyed to the town and distributed through 3¼ miles of 4 and 6 in. cement-lined wrought-iron pipe. The ordinary pressure in the mains is 35 lbs. There are 7 gates and 45 taps. There are no fire hydrants. The town pays $50 per year for one public watering trough. Service pipes are of galvanized iron.

The population in 1880 was 2,001. The daily consumption is not given.

The works have cost $6,000. The expenses are very small. The receipts in 1881 were $540.

CCCLXXX.—DOVER, DEL.

Dover, Delaware, in lat. 39° 10′ N. long. 75° 23′ W., is on level ground on St. Jones's Creek.

The town was settled in 1683.

Water-works were built for the city in 1882 by the Holly Manufacturing Company, taking the supply from a well 15 ft. in diameter and 22 ft. deep, sunk through 17 ft. of water-bearing strata. The water is pumped directly into the mains by two Gaskill steam pumping engines, under 40 pounds pressure for ordinary service.

Distribution is by 2½ miles of cast-iron pipe of 8, 6, and 4-in. diameter, with 28 fire hydrants and 10 gates. The works have just gone into operation, and the number of taps is not given. The maintenance and interest on bonds will be paid from a special tax. Service pipes are of lead and of galvanized iron.

The population in 1880 was 3,000.

The works have cost $20,000, which is the amount of the bonded debt at 4 per cent. interest.

The works are managed by a Water Committee of the Council. John A. Nicholson is Chairman, and George P. Jarrett the Superintendent.

[TO BE CONTINUED.]

The receipt of statistics, as follows, is acknowledged with thanks:

From C. L. Goodhue, statistics of the water-works of Agawam, Mass. From J. A. Nicholson, Chairman of Water Committee, statistics of the water-works of Dover, Delaware.

MEXICAN NOTES.

CITY OF MEXICO, Aug. 30.

Since the opening of the Central Railroad as far as the city of Leon great numbers of persons from the interior are arriving here daily to visit the capital, many of whom come to the city of Mexico for the first time in their lives, and would probably have gone to the other world without having seen the capital of the republic, if they had been doomed to make the trip in a diligence and expose themselves to a meeting with some band of highway robbers on the road. The railroads are changing the face of things in this country and bringing progress to the land of Montezuma in a most remarkable way. The Hotel Iturbide, which used to be the palace of the emperor, and which is immensely large, is having a new wing built, as it can no longer accommodate the passengers who apply for apartments. The Hotel San Carlos has also erected an additional wing, and several new hotels and boarding-houses have been opened to the public within the last two months.

The number of kilometres of railway built in the republic up to the first of this month has been officially published as follows:

	Kilo.
From Vera Cruz to Mexico City and Branch to Puebla	371
From Vera Cruz to Jalapa and Coatepec	144
From Vera Cruz to Medellin	22
From Esperanza to Tehuacan	50
From Merida to Progreso	36
From Mexico City to Leon	400
From Mexico City to Toluca	73
From Mexico City to Cuantla	138
From Paso del Norte to Chihuahua	300
From Puebla toward San Martin	38
From Puebla toward San Marcos	34
From Vera Cruz toward Anton Lizardo and Avarado	25
From Vera Cruz toward Jalapa and Chalchicomula	19
From Pachuca toward Irolo and Teoloyucan	45
From Altata toward Culiacan	30
From Merida toward Peto	28
From San Luis to Soledad	6
From Tampico toward San Luis	38
From Mexico City toward Salto, San Bartolo and San Luis	83
From Matamoras to Monterey	7
From Zacatecas toward San Luis	23
From Reyes to Tepetlaxtoc via Texcoco	28
From Nuevo Laredo toward Monterey	170
From Guaymas toward Magdalena	200
From Peubla toward Metamoras Izucar	23
From Chalco to Tlalmanalco	15
From Tramways in the Federal District, Puebla, Guadalajara, etc	130
Total	2 626

The legislature of the State of Michoacan has authorized the executive of that State to obtain a concession from the federal government for the construction of a railroad line to connect the capital of Michoacan with the Central Railroad at any point which may be deemed most convenient. The concession will be transferred to the company or companies which may be best able to guarantee the conclusion of the work.

According to a letter received here from a well-known citizen of Texas, Count Telfner will resume work by the beginning of next month on the railroad that runs on the coast of Texas and is to cross to Matamoras, passing through San Fernando, Victoria, Tampico and Tuxpan, with branches to this city.

The Department of Public Works has authorized the Mexican National Railroad Company to open its Toluca Division to the public.

The horse railroad from the town of Guadalupe to the city of Zacatecas, which belongs to the Mexican National Company, carried 33,901 passengers during the month of June. The new horse railroad which runs between Orizaba and the town of Ingenio was inaugurated a short time ago with great festivities and enthusiasm. This road is already doing a very good business.

The *Diario Official*, the organ of the government, has published lately several communications relating to the Tehuantepec Railroad, and among them one addressed to the Governor of the State of Oaxaca, in which he is instructed to proceed at once to the organization of gangs of workmen, up to the number of 6,000 for the present, in order to prosecute work as actively as possible on the above railroad, the construction of which the government is resolved to take into its own hands.

To-day's papers announce that the works were inaugurated on the 24th inst., in Tehuantepec, when a large number of persons were present, including the authorities, the most distinguished citizens and the corps of engineers definitely organized under the orders of Mr. Alexander Prieto.

A convoy of specie recently arrived at the town of Maravatio from the city of Morelia, bringing the sum of $125,000 for the National Construction Company. Work on that section of road, as on others, is rapidly progressing.

Orizaba, overrun with railway passengers arriving at and leaving that city, is clamoring for a sitting-room to the Mexican Railroad Company's station.

All these straws show how the railroad age is advancing in Mexico, thanks to the present state of peace and tranquility.—*Correspondence of N. Y. World, 15th inst.*

THE SEPARATE SEWAGE SYSTEM.

It is unfortunate that the separation of sewage and rain water in town wastes has been developed into a "system," and as such been treated in a commercial rather than an engineering spirit. The result of extravagant riding of any hobby is that an antagonism is excited which ought not to exist, and the good which exists on either side of the matter in dispute is overlooked or its very existence denied. Excessively conservative engineers are too apt to deny absolutely that there is any merit in even an old-established and much-used method of procedure which may be taken up by some shrewd person, and widely and enthusiastically advertised and puffed and proclaimed to be a panacea. On the other hand, this very extravagance of assertion captivates inexperienced engineers and amateurs, and they outdo their preceptors in invectives against any application of the fundamental principles of civil engineering which may be compendiously stated to be the application of common sense and science and experience to the solution of problems of construction.

Spasms of specialties like this are not without good results also, notwithstanding their first outcome is often absurd. They shake up the sleepy masses of engineers, who are content to run in grooves of other people's making, and set them to thinking about the real principles underlying their work. The consequence is that the professional men who have minds of their own are led to adopt what the extremists on each side sneer at as a compromise, but is really a wise "natural selection." But in the meantime damage is done to property by ridiculous running to extremes, not to speak of the injury to the temper of the combatants, and the want of confidence created in the public mind by the antagonistic and positive assertions put forth by men who ought to agree.—*Sanitary Engineer, 14th.*

THE WESTERN MINING EXPERT.

This evening, while smoking an after-supper pipe and talking complainingly to my host of the fraud that had been practiced on the miners in regard to the promised stuffing of these experts, my arm was lightly grasped. Turning, I saw a neatly dressed gentleman standing by my side. He smiled pleasantly when our eyes met, and extended his hand in the most friendly manner. Seeing that he expected me to shake hands, I arose and did so. He called me by name and inquired almost tenderly into the condition of my health. I could not recall this man to memory. Puzzled, I looked at him, and as I looked the broadcloth disappeared. It was replaced by a white apron. The peculiar smell of oil stoves was wafted to me. The vision of a dingy room, papered with cheap brown paper, arose before me. I could see and hear a howling blizzard sweeping through the streets of a dirty frontier town, and my gentlemanly acquaintance, astride of a beer keg, was behind the only barrel of shell oysters I ever saw in western Kansas, dextrously twirling an oyster knife, and, with manners acquired at the University of Geneva, pressing me to wash down the oysters with draughts of Milwaukee beer out of a huge earthenware pitcher. I could not help smiling. Taking a seat by my side, my acquaintance said: "I have quit shucking oysters for Kansas Grangers. I am a mining expert."

During a long talk that followed, he explained to me how the broken-down merchants, saloon keepers and politicians became mining experts. He said they acquired a slight knowledge of chemistry, including a course of fire assaying. They attended a course of lectures on geology. They learned the names of the different ores and country rocks. Then, going to a mining camp, they opened an assay office and claimed to be mining experts; this when they had never been in a mine. I expressed my astonishment, and asked if an actual expert would not be apt to expose them. Shaking his head negatively, he said: "No. No one knows anything about the formation of ore in fissures. These mountains are full of geological contradictions. You cannot safely dispute any statement a miner may make. Of the permanence of leads, of the probabilities of a continuance of a pay streak, of the worth of an undeveloped mine, no one can possibly know anything. Given a fair knowledge of geology, a smattering of chemistry, unbounded assurance and an accurate knowledge of the output and working of famous mines, and any one can safely meet these high-priced experts. The truth is that none of them knows anything, and they are all afraid that the man they are talking to may be the one man in the mountains who thoroughly understands his business and actually knows what the expert pretends to know. I assure you that none of us really know anything. When a valuable mine is discovered, we talk learnedly about it. But why the ore in that particular

portion of the fissure is rich, and why the extensions on the vein is generally worthless, and why the pay peters out, no living man knows. We are all humbugs. Almost all of us are for sale, from the examiner of the Little Pittsburgh to the puffer of the Monarch of Silver Mountain; and the opinion of the cheap puffer is just as valuable as that of the high-priced examiner; and neither of them is worth any more than that of the silent Cornishman who twists a drill in the face of the sixty-fathom level."

My candid acquaintance arose. Laughingly he bade me good night, and, lighting a fresh cigar, he walked out of the hotel. He had given voice to my own opinion about mining experts. It is a great pity that they are not all stuffed and cased. —*Frank Wilkeson in N. Y. Sun.*

AUTOMATIC INDICATOR FOR DETERMINING MERIDIAN TIME.

There was recently exhibited in the window of Messrs. Queen & Co., opticians and mathematical instrument makers, of 924 Chestnut street, Philadelphia, an automatic indicator for the use of navigators in determining meridian time, latitude, etc. The indicator in question was patented December 8, 1874, and was on exhibition at the Centennial Exposition in 1876. The inventor is John Devlin, 803 North Third street, Philadelphia. President Allen, of Girard College, who is said to be favorably impressed with this invention, has described it as follows: "A hemisphere so placed that its equator coincides with the horizon. A magnetic bar moves freely on a pivot at the pole, and a small piece of wire crosses the bar at both ends. In places where the magnetic and terrestrial meridian coincide, the shadow of the bar on its pivot will indicate solar or apparent noon, and the shadow of the wire on the south end of the bar falling on the meridian at noon, will limit a certain arc of the meridian between the shadow and the equator. When the sun's declination is south, this arc will be equal to the latitude of the place minus the declination. Therefore, when the sun's declination is known, the latitude of the place may be found by a meridian observation of the dial; and, when the latitude of the place is known, the sun's declination may be found by a similar observation." The inventor claims that the moon's meridian may also be taken with the instrument, is always adjusted for use, and that it is of advantage in cases where the sun appears only for a moment or two, or long enough for the indicator to take the latitude of a ship as shown on the hemisphere, requiring no calculation on the part of the captain. We understand that Mr. Devlin sailed for Liverpool on the Illinois some time since, and that on the voyage a practical test of the merits of this indicator were to be made by the officers of that vessel.

SUCCESSFUL EXPERIMENTS TO PROPEL STREET CARS BY ELECTRICITY.

A special dispatch from Pittsburgh to the Philadelphia *Press* says: An invention which, it is claimed, will revolutionize the street railroad travel was successfully tested in the yard of the Union Passenger Railroad Company in this city yesterday. It consists of an electric motor designed to propel street cars, which has recently been patented by Dr. J. R. Finney, of this city. A car weighing six tons was used in the experiment. The electro motor was suspended below the level of the floor by a truss attachment to the truck. The only machinery in addition to the simple dynamo machine, rated at one and a half horse-power, was a series of gear-wheels by which the car-wheel was made to revolve once in thirty revolutions of the motor, which propelled the car at the rate of 10 miles an hour. The electricity is produced by a dynamo-electrical machine, located at any point, and is conveyed on a wire suspended a short distance above the car on brackets attached to arms extending from posts set at the side of the track. The current is led from this conductor to the motor by a contract traveler consisting of a grooved pulley, held loosely on the conductor by another pulley on the other side. The current is grounded through the wheels and rails, the latter having a continuous connection, in order to make a more perfect ground. The traveler is drawn along the wire conductor by the car, and the pulleys are so adjusted that they pass over the brackets without breaking the contact, furnishing a constant and steady supply of electric power to the machine, which it transfers into motion, just as the old-fashioned mill wheel converts the weight of water into motion, and transmits through the proper gearing to the burrs, which in turn convert wheat and corn into flour and meal. The entire machine could be placed in a medium-sized shoe-box, and does not exceed three hundred pounds in weight. Even this weight may be greatly reduced, as the gearing is all unnecessarily heavy. The person in charge of the car can increase the power at will, even concentrating it all on a single motor if necessary. The current reversed will serve as a brake in going down grades, and in this respect will be more effective than any other ever used.

In addition to propelling the cars by electricity, Dr. Finney has designed electric lamps for lighting them, the power to be taken from the same conductor. A company with large capital has been organized to push the invention, and it will likely be adopted in the Union Line before long.

IRISH RAILWAYS.

The London *Mining Journal* says: "Statistics prove that there has hitherto been a most unaccountable absence of railway and commercial enterprise in Ireland, and that there is ample room for great expansion. Proportionately to other parts of the United Kingdom the extension of the railway system in Ireland has been very small indeed. There has been no material improvement in trade and commerce, no commensurate development of its collieries or mining industries for many years past, while there is a positive decrease in population. In the year 1801, when the union with England was effected, the population of England was 9,334,549, while last year it had increased to 25,968,286. In Ireland, in 1801, the population was 5,319,867, while last year it was only 5,159,839, so that while England has nearly trebled its population within the past 80 years, Ireland has lost nearly 200,000. This decreased population and the stagnation of trade and commerce is unquestionably due to the absence of railways and of commercial enterprise. Again, the total length of the railways open in Ireland on Dec. 31, 1881, was only 2,370 miles, the nominal capital being only £33,741,058, the gross receipts £2,695,272, and the net revenue £1,230,635. Thus for the whole of that extensive country the total capital expended on its railways and their total revenue is scarcely one-third of the amount expended and earned upon one of the great railway systems in England. The nominal capital of the London and Northwestern Railway Company is no less than £92,456,537, and its gross receipts were, in 1880, £9,827,022. The nominal capital of the Great Western is £66,693,695 and the gross receipts £7,281,329. The Midland nominal capital is £67,807,681 and the total receipts £6,771,884. The nominal share capital of the Northeastern is £55,137,019 and the gross receipts £6,436,852. Compared with other of our English lines, those of our sister isle would bear equally significant results. These facts prove there is ample room for almost any expansion of railways, and the outlay of English and resident capital if anything like Government guarantee could be obtained for a fair return thereon. It might be added as an inducement to capitalists to turn their attention to Ireland for the investment, that the cost of railway work there is most moderate, owing to the almost entire absence of tunnels; that the average cost of the lines constructed was only about £16,000 per mile, while the last official returns showed that, notwithstanding the adverse circumstances under which they labored, the dividends averaged £3 14s. 9d. per annum for the past year. The whole of the Irish lines are exempt from the payment of Government passenger duty."

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

WATER FOR SWAMPSCOTT, MASS.—This town would like to obtain a supply of water from Lynn, but it is doubtful if this can be accomplished until the source of supply is increased. The capacity of a water supply is to be determined by the year of low rainfall, as that is the contingency to be provided against. For the three years from 1879 to 1881, inclusive, with a rainfall averaging 41.54 inches, the records give the total amount of water received into the Lynn ponds at 1,389,757,618 gallons, and the amount consumed for the same period 1,380,818,523 gallons, or only 9,000,000 less than the entire supply by rainfall. This amount of water insured for the next three years will not be sufficient to supply the demand, as the city is growing, and the consumption constantly increasing. In view of these facts it is a question if Lynn can afford her neighbor any water. If Swampscott is denied a supply from this source, then she has the Swamscott Water Company to deal with, which corporation is ready to pipe the town and supply the water from its tubular-well system.

EXTENDING ITS SERVICE.—The common council of Salem, Mass., has appropriated $2,500 to extend its water-pipes.

BIDS REJECTED.—The water commissioners of Springfield, Mass., have rejected all the bids received for the construction of the dwelling-house at the Ludlow reservoir, none of them being low enough.

THE CURTIS REGULATOR CO., of Boston, has received an order for some large steam-traps from the Westbrook Manufacturing Co. (Cotton), it being their fifth order for Curtis traps and regulators.

GAS LIGHTING IN WASHINGTON.—Mr. S. Calvert Ford, the inspector of gas for the district of Columbia, has submitted his annual report to the Secretary of the Interior. He says: The gas manufactured and supplied by the Washington company is not entirely a product from coal. They use naptha as an enricher. This hydro-carbon is converted into a fixed gas and then united with the gas obtained from coal. This combination of the gases from coal and naptha yields an illuminating gas of high specific gravity. On some occasions complaints were made of its giving off smoke. This nuisance, however, will arise from several causes, such as a scant or inadequate supply, imperfect or unsuitable burners and a deficient pressure. The gas supplied by the Georgetown company is manufactured entirely from coal with cannel coal, ten to fifteen per cent. being used as an enricher. The illuminating power of the gas supplied by the Washington company, on an average for the year, was 16.87 candles. The highest power during the year was 18.53 candles, and the lowest 14.49 candles. On eighteen occasions during the past year the gas supplied by the Washington company was of less illuminating power than sixteen candles. The average illuminating power of the Georgetown company was 16.94 candles. The highest 20.16 candles, and the lowest 13.86 candles. On twenty-eight occasions during the year the gas of the Georgetown company was less than sixteen candles. Fourteen hundred and twenty metres were inspected and proved. With the exception of 2 metres inspected and proved by the Alexandria company, the above number was inspected and proved for the Washington company and for consumers of gas. The result showed that 33 registered fast against the consumers, an average error of 3.56 per cent.; 117 slow against the companies—average error 7.21 per cent.; 1,216 within the limits allowed by law, viz., 2 per cent. either way; 51 did not register the gas flowing through them, and 1 was locked, so no inspection could be made. 220 were inspected and proved on complaint, 55 by consumers of gas; 17 registered fast—average error 4.16 per cent.; 13 slow—average error 3.96 per cent.; 25 within the limits allowed by law. 165 were complained of by the gas companies; 3 registered fast, and 91 slow; 19 within the limits allowed by law. The inspector recommends that the act of Congress regulating gas works be modified so as to require when, for any purpose whatever, the heads of meters that have been inspected, proved, and sealed, are removed by the gas companies, meters of this description should be classed as repaired meters, and brought to this office for re-inspection before again being placed in service. The seal of the inspector is the evidence that the meter has been properly tested and proven, as required by law. To admit the right of the companies to remove the head of a sealed meter and rectify whatever is wrong, and return the meter to service without re-inspection and sealing, would be to render the law practically inoperative, by making uncertain, if not impossible, the protection secured through inspection and sealing by the office created for that purpose.

PORTSMOUTH CITY, Va., is to have water-works, the same to be built by a private corporation. They will draw their supply from Lake Drummond, which is a distance of about 20 miles from the city. Survey nearly completed.

INVESTIGATING A GAS COMPANY.—RICHMOND, Sept. 8.—The City Council committees on finance and light to-day appointed a sub-committee to visit Philadelphia and inquire into the financial standing of the Limited Gas Light Company, of that city. This company has a proposition pending before the Richmond Council for the lease of the gas works of this city for a period of thirty years. The sub-committee appointed will leave for Philadelphia upon that errand soon.

THE rain-fall at San Antonio, TEX., during the storm on the 6th inst. amounted to six and one-fifth inches—the heaviest known there in the same space of time.

THE Cambria Iron Company, Johnstown, has erected an additional water supply for their works capable of yielding 20,000,000 gallons a day.

ELECTRICITY.

FRENCH UNDERGROUND TELEGRAPH.—An underground telegraph system between Paris and Marseilles is nearly ready for use in France. Three weeks ago 150 men were engaged in pushing forward the work from both ends, following the main roads and the right bank of the Rhone. From a description by *Iron*, the English journal, it appears that the pipes are laid at a depth of more than a metre and a half, and chambers for facilitating repairs are placed at about every 500 metres; they resemble large cast-iron caldrons with covers, and have apertures for receiving the ends of the two pipes which they connect. Every 100 metres the pipes are united by cast-iron couplings, which will permit of inspecting and repairing the cable, and the joint between each pipe is made with an india-rubber washer or lead collar. "The work is pushed forward with vigor," adds the same paper, "and it is proposed eventually to connect this cable, which will traverse France from north to south, with the cables of the Mediterranean and Atlantic."

ELECTRIC RAILWAY.—There are now in operation in Europe about one hundred miles of electrical railways, and numerous others are projected. Those in operation include one at Litchterfelde and that from the Spandauer Rock to Charlottenberg, near Berlin; another from Port Rush to Bush Mills, in the north of Ireland; and in Holland, from Zandvoort to Kostverloren. Among lines in construction are: In Austria, the Moedling line, near Vienna; in Germany, from Wiesbaden to Nurnberg, and from the royal mines of Saxony to Zankerode; in England, under the Thames, connecting Charing Cross and Waterloo stations; also in South Wales, for which the force will be derived from the fall of water. In Italy, Turin and Milan will soon begin the construction of electric roads.

DR. SIEMENS, President of the British Association, is certain that the steam engine is doomed. Its fate is first to be confined to the driving of large dynamo machines, which will distribute force at present supplied by a myriad small and wasteful steam engines, and then to be superseded altogether by the gas engine. Gas and electricity may be mutually hostile, but they are to

unite their forces in order to extirpate the steam engine on account of the wastefulness of the latter in the consumption of fuel.

STREETS, DRAINAGE, ETC.

THE COMMITTEE on SEWERS, of Boston, want an additional appropriation of $51,416 to complete the work of the year. The appropriation for the present financial year was $200,000, of which $140,416 has been expended; to finish contracts already in progress will require $34 000; to build sewers already ordered by the Board of Aldermen, $17,000; to build sewers petitioned for and not ordered, $12,000; for running expenses of department, with the usual amount of repairs, etc., $48,000.——The Committee on the Stony Brook sewer will ask for an additional appropriation of $20,000 to finish the job, which was estimated would cost $130,000, but upon which $180,000 has already been expended.

SEWERAGE OF WATERBURY, CONN.—The Sewer Commissioners recommend to the Common Council a complete sewerage system for the city, planned by Civil Engineer Rudolph Hering, of Philadelphia, and costing some $73,330. Engineer Eliot C. Clark, of Boston, has also looked over the city and made a roport. The Common Council will act on the reports at its next meeting. The Council has appropriated $5,000 to secure the Gamewell fire system and provided for the appointment of a fire marshal.

PROPOSALS for improving certain streets of Washington, D. C., will be received by Major G. J. Lydecker until Sept. 19.

RIVERS AND HARBORS.

THE MISSISSIPPI RIVER LEVEES AND JETTIES.—The bill passed by Congress appointing a special committee to investigate and report upon the Mississippi River levee and jetty systems, appropriated $5,000 to defray the expenses of the committee; but, by an oversight on the part of the framers of the measure, made the amount available after the presentation of vouchers covering the expenses of the committee. The committee is to meet at Cairo, Ill., on November 10, and in order to obviate any inconvenience to its members, and to insure their meeting on the day indicated, Sergeant-at-Arms Hooker has placed $5,000 out of his own personal fund to their credit.

RAILROADS.

SILVER CITY, DEMING AND PACIFIC RAILROAD COMPANY.—This company has recently been incorporated under the laws of New Mexico, designed to connect at Deming with the Atchison, Topeka & Santa Fe, Southern Pacific and Texas Pacific railroads. The road was organized by prominent bankers and merchants of Grant County, who have raised all the necessary funds, and the road is now being graded to Silver City, forty-five miles west of Deming. The road is broad-gauge, but the intention is to connect the road at Silver City with narrow-gauge branches to Santa R ta, Fort Bayard, Georgetown and the Moggalon, Lake Valley mines and the Clifton mines. It is designed by the present company to build next year narrow-gauge branch roads to Santa Rita and Georgetown, and to the Clifton copper-mining district in Arizona.

A PRELIMINARY survey has just been started for a narrow-gauge railway from Norfolk, Va., to The Hollies (a proposed watering-place on the Atlantic Ocean beach, five miles from Cape Henry Light down the coast). It is proposed to advance the construction as soon as the survey is completed. The line will be about twenty miles long.

WORK ON A MAINE ROAD.—Track is now lain on the Bangor & Katahdin Iron Works Railroad to Foster Brook, Me., 10½ miles northward from the late terminus at Brownville, and 16½ miles from the Bangor & Piscataquis road at Milo. About three miles are to be laid to reach the Katahdin Iron Works.

WEAR OF RAILS.—The Great Central Belgian Railroad has prepared some elaborate statistics as to the wear and tear of rails upon its system. It appears that after twelve years' service only 38 per cent. of the steel rails laid down upon its system in 1869 had been withdrawn in 1881. On the other hand, the proportion of the iron rails laid down in 1869 and withdrawn in 1880 was 95.74 per cent. of the whole number employed. Since the organization of the Great Central Belgian Railroad Company in 1865, it has employed 79,116 tons of rails, of which 67,569 tons were iron rails, and 11,547 tons steel rails. Of the iron rails laid down, 31,847 tons have been replaced, while of the steel rails laid down only three tons have been replaced.

THE mileage of new railroads completed last week was 124 miles, making 6,668 miles thus far this year, against 4,018 miles reported at the corresponding time in 1881, 3,196 miles in 1880, 1,798 miles in 1879, 1,160 miles in 1878, 1,176 miles in 1877, 1,467 miles in 1876, 702 mil s in 1875, 1,006 miles in 1874, 2,455 miles in 1873, and 4,498 miles in 1872.

NEW YORK, Sept. 13.—To-day the track of the Mexican National Railway is laid 102 miles out of the City of Mexico; 170 miles from Laredo to Monterey; and something over 7 at Manzanillo—in all 279 miles built under the main concession. This completes the "450 kilometres" stipulated in the main concession to be finished within two years from the beginning of construction. This term of two years does not expire until Oct. 14, 1882. We have built in Mexico now, under other concessions, 74 miles additional, making our mileage already constructed in Mexico 353. The Texas Mexican lines extend 179 miles, making the total constructed mileage of the company to date 532 miles.

A FLORIDA SCHEME.—A railroad is to be built connecting Jacksonville, Fla., with the seaside. The road is to be 13 miles in length, narrow gauge, and is to cost $100,000. It will be called the Arlington & Atlantic Railroad.

TRACKLAYING is progressing on the Swedesboro' Extension, N. J., ¼ mile per day.

THE work of double-tracking the Cincinnati, Hamilton & Dayton Railroad has commenced at Schenck's Station, working to Lockland, and when completed will be a continuous double track from Cincinnati to Hamilton.

LOCOMOTIVES FOR NARROW GAUGES.—The narrow-gauge people are still striving for greater tractive power. As the traffic increases their resources are severely taxed, and, burdened as they are with small cars, they find that long trains are necessary, and, consequently, to get power to do the work, unusually heavy engines are needed. As they are usually limited by their very light rails, the weight on each driver has to be kept down. Consequently, even for passenger work, they have had to resort to "moguls," and "consolidations" are commonly used for freight. One of the latest of these engines, built by the Baldwin Locomotive Works, has 10 drivers, an overhanging fire-box back of the drivers, cylinders 16 in. in diameter by 20 in. stroke, 37-in. driving-wheels, and a total wheel-base of 15 ft. 5 in. The rigid wheel-base is 9 ft. 9 in. The boiler, which is intended to burn wood, is 52 in. in diameter, with flues 13 ft. ⅝in. long, and a fire-box 43¼ in. long, 48 in. wide and 54½ in. deep. These engines are very light on the rails, the great number of driving-wheels giving the necessary adhesion without excessive weight upon any one pair.

EXTENSION OF THE C. & O. COMPLETED.—The extension of the Chesapeake & Ohio Railroad from Newport News to Fortress Monroe, Va., has been finished. Through trains to the West will be put on about Oct. 1.

RAILWAY EXTENSION.—The Montreal, Portland and Boston Railway is now completed from West Farnham, Que., to East Franklin, Vt. The road will soon be completed to Sheldon. A dispatch from Canton, O., says that the Cosbocton and and Straitsville extension of the Connotton Valley Railroad is now completed to the Cleveland, Tuscarawas Valley and Wheeling Railroad crossing, eighteen miles south of Canton. The work will progress southward as fast as money and men will permit. The Utah division of the Denver and Rio Grande Railway is completed to Montrose, on the Uncomphagre River, 352 miles from Denver. The link necessary to connect the Colorado and Utah systems is now reduced to 275 miles. The New Orleans division of the Texas and Pacific Railway will be opened to-day. The road has been in operation since last Spring from Marshall to Cheyneyville, and at the latter place it connected with the Morgan's, Louisiana and Texas Railroad. The road runs from Shreveport to New Orleans, a length of 350 miles. The Danville, Olney and Ohio River Railroad Company celebrated the completion of the northern division of their road from Danville to Olney by running an excursion train over their road on the 23d ult. The Wisconsin Central's new line from Neenah to Oshkosh will be finished to-day. It is expected that the entire new line to Milwaukee will be finished by the close of the present month.

THE NORTHERN PACIFIC AND THE WISCONSIN CENTRAL.—It is reported that an arrangement has been made between the Wisconsin Central and the Northern Pacific for the building of a road from Superior City to Ashland. The Northern Pacific is finished from Thompson, at the head of the St. Louis Rapids to Superior City, and that portion of the road has been accepted by the government. It is the general opinion that it would be best for the Northern Pacific to buy the Wisconsin Central, and then, by an arrangement with one of the Milwaukee roads, or the building of 85 miles of new road, the trains could be made up in Chicago to run through to Puget's Sound. It is believed that this will be ultimately accomplished.

THE Fort Worth and Denver City Railway was completed to Wichita Falls, the terminus of its first division, 110 miles from Fort Worth, Tex. Through trains will be run in a few days.

PEMIGEWASSET VALLEY RAILROAD.—The first regular track-laying on the new Pemigewasset Valley Railroad began at Plymouth, N. H., on Monday, at the junction with the Boston, Concord & Montreal Railroad. Robert Caldwell, of Sheldon, Vt., contractor, has 17 men at work, and more are coming. The 20 miles to be laid to Woodstock will be finished about Nov. 1. Nearly all the grading, bridges, etc., are now done.

CHICAGO'S STREET RAILWAY.—CHICAGO, Sept. 12.—Judge Gardner rendered a decision to-day in the case of the use of the streets by the South Side Horse Railway Company by cars propelled by cable, which in turn is moved by steam. The application was for an injunction to prohibit the company from the use of the cable under its charter as a "horse railway" company. The court practically decided the whole case by holding that the proper designation of the road was a "street railway." The power and jurisdiction of the City Council over the streets, and over their use and occupancy, and over the question as to how vehicles may be propelled upon them, whether by steam or otherwise, was held to be unquestionable. The City Council having granted the right to use the cable, which was moved by steam, the authority of the street railway company could not be restrained in the manner sought. The injunction was therefore refused. Practically, therefore, the horse railway or street railway question is in the control and discretion of the City Council, subject only to such restrictions and limitations as may be contained in the general character of the city and in the special charters of companies. Within the limits of the company's charter and the contracts hitherto made, the City Council has as complete control over those railways as it has over any other matters of city legislation.

CONTRACTS LET.

RAILROAD CONTRACT LET.—OTTAWA, Ont., Sept. 13.—E. A. C. Pew has completed his arrangements and signed a contract with the Souris & Rocky Mountain Railway Company to build their line from a point on the Canada Pacific Railway 100 miles west of Winnipeg to the Rocky Mountains. Mr. Pew has also purchased a controlling interest in the company. The Souris & Rocky Mountain Railway runs in a northwesterly direction through Rapid City, Fort Ellice, Battleford and Edmonton.

CONTRACTS LET FOR REPAIRING.

HOUSE OF CORRECTION, CAMBRIDGE, MASS.—The contract for repairs at the house of correction, which include the erection of several new buildings, has been awarded to J. H. Coon, of Boston for $80,926. The highest bid was $82,788, and the price does not include the cost of excavating, placing of stone work, boilers, etc. By the terms of the contract the walls at the east of the hospital are to be removed, and there will be built a boiler house and stable in one building, 37x68 ft.; the brick building known as "Bummers' Hall," the old chimney, stable, boiler-room and wall on Spring st., are to be torn down, and an addition to the present prison 46x57 ft. is to be constructed. This will contain a block of 110 cells, an entrance 26x52 ft., and be three stories in hight. There is also to be an extension of the workshops 42x44 ft. and three stories high. One-fourth of the division walls, between the old cells in the cell-block on Third st., are to be removed and new ones constructed; there will also be new doors to the cells much better than those at present used, and there will be much better light in the corridors than now. The work is to be completed by Jan. 1, 1883.

CANALS.

THE PANAMA CANAL PROJECT—LONDON, Sept. 8.—A dispatch from Paris says: "The subscription for the Panama Canal Company of 250,000 bonds of 500 francs each is considered a success.

BUILDING.

PROPOSALS FOR TWO HUNDRED HOUSES.—R. M. Kennedy, of Second and Wood streets, Pittsburgh, Pa., will receive proposals for designs and building 200 frame houses of from three to eight rooms each.

BUILDING SITES APPROVED.—The Secretary of the Treasury has approved the recommendation of the commission on the selection of a site for the location of a public building at Minneapolis. He has also approved the site selected for the public building at Detroit, in so far as concerns the offer of Mr. Joys to sell his lot adjoining the present post-office property for $26,000. The owner of the other lot selected for the extension has been notified that his terms of sale ($34,000) are too high, and that unless he will accept a lower figure for his properly it will be secured by condemnation.

THE Watertown (Mass.) Public Library contract has been given to David Perkins, carpenter, of Boston, who will take charge of the sub-contracts and be held responsible for a satisfactory completion of the entire structure, including the heating apparatus, but not the bookcases and furnishings, the price being $96,543. Messrs. G. R and R. G. Shaw, of Boston, are the architects.

WORKS are to be erected in Wilmington, N. C., by New York and foreign capitalists to treat sulphuretted gold ores.

BRIDGES.

BRIDGING THE HUDSON.—Plans have been commenced by the officers of the New York and New England Railroad, and other capitalists, on a bridge to cross the Hudson at Newburgh, N. Y.

WORK ON THE EAST SYRACUSE BRIDGE.—There are about 150 masons and stone cutters at work on the big bridge of the West Shore railroad near East Syracuse, N. Y.

A BRIDGE that is warranted to support a strain—a bridge of a fiddle.

COFRODE & SAYLOR are building the Atchafalaya bridge for the Texas Pacific Railroad Company. The structure will be 800 ft. long, with two spans of 250 ft. each, and one draw span of 300 ft., to be operated by an engine. The work of constructing the Monongahela River bridge, 5,400 ft. in length, has been commenced. It will be the longest iron bridge in the United States.

THE McKeesport Youghiogheny Bridge Co. has been authorized to own and maintain a bridge over the Youghiogheny River at McKeesport, Pa., and will soon be ready to let contracts for the work.

THE Louisville Bridge Co. is putting up an iron bridge of 125 ft. span at Shoal River, Fla., on the Pensacola & Atlantic road. It will be 1,400 ft. long.

THE Keystone Bridge Co., at Pittsburgh, has the contract for the new bridge over the Ohio at Point Pleasant, W. Va., for the Ohio Central road.

THE Patapsco Bridge & Iron Works of Wendell Bollman in Baltimore are building several bridges for the West Virginia Central & Pittsburgh road. They have also a good deal of roof and building work on hand.

MISCELLANEOUS.

A FORTY-NINE TON FLY-WHEEL.—The largest fly-wheel of a stationary engine ever constructed in the United States was completed by Watts & Campbell, Newark, for Clark's Thread Works, in the same city. The wheel is built in seven sections, each weighing seven tons. It is twenty-five feet in diameter and its "face" is seven feet six inches. It has three crowns on which three twenty-four-inch belts run. The lathe was two weeks running, night and day, in turning off the face of the monster wheel, and five tons of chips were planed from the surface. It took 5 minutes 55 seconds for the wheel to make one revolution on the lathe. The total weight of the wheel is forty-nine tons.

THE WRECKED STEAMER NANKIN.—Colonel Gillespie, on the 14th, opened the four bids which had been received at the Army Building for raising the wreck of the English steamer Nankin. The contract was awarded to Mr. Samuel R. Cummings at $24,749, the lowest bid. The Nankin was sunk in the Swash Channel by a collision with the steamer George W. Clyde on April 28, and is now broken in two parts. The wreck was sold at auction to C. R. Hasrick, who subsequently transferred it to Mr. W. E. Chapman, of No. 75 South street. Mr. Chapman claims that the wreck is his property and that he is using all diligence in removing it, and therefore protests against the government's action.